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POPULAR AND PRACTICAL ENTOMOLOGY.

REMARKS ON COLLEMBOLA.

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That ingenuous character, the Man in the Street, commonly holds the erroneous opinion that an entomologist is a person who knows all about insects. Consequently, on the rare occasions when he brings some Entomological Department a "bug" to be named, if his specimen happens to be anything a little less common than a cicada or a Luna moth, he sustains a distinct shock when he finds that even the professional entomologist cannot tell him offhand exactly what it is, and must refer it to a specialist for determination. Our friend's surprise is, of course, due to the fact that he does not realize the vast, overwhelming abundance and variety of insect life; and he is not aware that no investigator, however studious, can even in the course of a whole life-time become acquainted with more than a small proportion of the prodigious number of different creatures included in the class Hexapoda.

And, besides the sole weight of numbers forcing the student of insects to specialize if he wishes to make any real progress, other influences also work in the same direction. The moths and butterflies, for instance, attract such a host of collectors as much by their beauty as by their biological interest, that there are probably more students of Lepidoptera than of all the other orders put together. Beetles, too, make a fine showing in a cabinet, and Coleopterists are legion. Then again, we are forced to give earnest if unwilling attention to those pestilent and all too numerous insects that devour our crops, bite our bodies, inoculate us with disease, or otherwise interfere with our living. All this tends to focus entomological study on certain handsome or obnoxious orders and categories, while other less showy or more inoffensive insects are passed over.

One of these neglected orders is the Collembola, familarly known as Springtails. These insects are so minute that, preserved in alcohol in tiny vials or mounted on microscope slides, they make no display in a collector's cabinet. And they are practically without economic importance. Some slight injuries to garden and greenhouse have been alleged against them, but their very worst depredations bear about the same relation to the virulent activities of say the locusts or the mosquitoes, as a small boy with a peashooter does to a German army corps invading Belgium. Consequently, they have been little studied.

Unassuming and harmless as they are, however, they have always attracted some attention. Owing to their wide distribution and, at times, extraordinary abundance, they drew some notice even from the earliest naturalists. I do not know that they are mentioned in the classic though unreliable pages of the Elder Pliny, but Linnæus did not overlook them, and with his passion for classification, duly tabulated them in his great "Systema Naturæ" under the generic name of Podura.

But a century later we find Nicolet reproaching naturalists that they have attached but little importance to the study of the order; and in 1872 Lubbock in his elaborate Monograph repeats the same complaint. Even to-day the sum of Collembola literature,—for the most part scattered through reviews and "proceedings" in half a dozen different languages—comprises only a few score papers. Nicolet's Memoir of 1841 and Lubbock's Monograph of 1872, although both beautifully illustrated with drawings and coloured pictures of an excellence seldom seen in modern insect books, are not nowadays of much use to the systematist. Linnaniemi's large Memoir (1907–1912) on the Apterygotan fauna of Finand is very useful to the American student, as many European species occur here. Guthrie's "Collembola of Minnesota" (1903) is the most comprehensive American volume, but the collector in this part of the country soon comes across numerous species not mentioned by Guthrie. However, Dr. J. W. Folsom, of the University of Illinois, the well-known authority on the Order, has lately published several exhaustive memoirs on certain of the North American sub-families, and I understand has others in preparation, so we may hope to have soon accurate and authoritative descriptions of all the known species on this continent. And we should be glad of this, for the Collembola are well worthy of study. The economic entomologist with his mercenary instincts may elect to ignore them, but their exceedingly primitive development makes them intensely interesting to the student of insect genealogy; while the astonishingly wide dispersal of some of their species and genera over the globe points to the immense antiquity of the Order, and sets some hard problems for the geologist to account for the primordial distribution of land and water.

If the bees and the ants be regarded as the aristocrats of the insect world, we must look on the springtails as belonging to the submerged tenth. They are among the most primitive of the "six-leggers." Some writers class the Thysanura as the lowest of the true insects, while others confer that doubtful honour on Berlese's Mirientomata; but all agree in placing the Collembola second on the list, only one step above the simplest known hexapods. The Order is divided into two suborders: the Arthropleona and the Symphypleona—which may be translated as the "Jointed-abdomens" and the "Together-grown-abdomens." The terms well express the difference in the appearance of the two divisions. The Arthropleona, which are considered the more primitive, have a well-marked head carried horizontally and bearing a pair of antennæ usually four jointed (but six jointed in one genus). The thorax consists of three conspicuous segments each with its pair of rather short legs, and the elongated abdomen is made up of six distinct divisions. In the Symphypleona the head is vertical, the constricted prothorax simulates a neck, while the other thoracic divisions are fused with the abdomen into an unsegmented globose body, the insect somewhat resembling a minute spider. (See plates III and IV.)

All the Collembola are without wings, and as no trace of these appendages can be found in the embryo at any stage of its growth, it is apparent that the wingless condition is primitive, and not the result of degeneration, as in the case of numerous other insects. Typically the mouth-parts of both sub-orders are withdrawn within the head, and are adapted for chewing, but in a few genera they project in a suctorial cone.

About 700 species of Collembola have been described so far, and of these some 200 have been found in North America. But there are certainly a large number to be discovered yet. Dr. Folsom estimates the collembolan fauna of this continent at not less than 250 species..

They are all very small, delicate insects, ranging from one-half millimeter to five millimeters in length, but the commonest kinds are from one to two millimeters long. Their integument is very soft, and great care is necessary in handling them. Most of them are clothed, thinly or densely, with hairs of a remarkable variety of form. There are long, slender, simple hairs, and stiff, spiny bristles; there are wide, ribbon-like hairs, and hairs terminating in fancy spear heads and in cups; there are hairs with flat, broad bases notched along one edge; there are feathered hairs, clubbed hairs and hairs bent over sharply at the ends. Of course, no one species possesses all these different kinds of hairs, but most springtails can boast of three or four varieties at least. For convenience sake, we speak of these growths as hairs, but they have little in common with the hairs of a mammal that grow out through the skin like an onion in a garden bed. A springtail's hairs are really continuous outgrowths of the integument, and when the insect moults its skin, as it does frequently in the course of its life, it sheds the outer layer of these so-called hairs also.

A few genera are covered with scales, not unlike the scales on a butterfly's wing, but very much smaller. These scales are lined and fluted so minutely that they are often used as test objects for microscopes, and the exact nature of the markings appears to be as hard to make out as the pattern on a diatom.

In colour the Collembola run through the whole spectrum from red to violet with black and white thrown in. Some are coloured uniformly all over, some are irregularly blotched and spotted and some wear veritable Joseph's coats of complicated symmetrical designs. Most of the colour is pigmentary, but the scaled species often show beautiful iridescence.

Some species are very constant in their coloration, while others assume several different liveries according, it would seem, to their food or their habitat. Thus *Sminthurus hortensis* Fitch, taken on garden beds, is a very dark purple with minute yellow spots, whereas a bright yellow variety, indistinguishable in everything but colour, is found living in the adjacent grass. *Achorutes armatus* Nic. may be a dirty white, pale violet, wine colour, or dark blue; and one variety, Dr. Folsom says, is canary yellow mottled with lavender. The common and abundant *Podura aquatica*, known all over the northern hemisphere, has always been described from the time of Linneus himself as dark blue with red brown legs and antennæ. But *P. aquatica*, recently found in the vicinity of Arnprior, Ontario, is coloured uniformly red all over. Indeed, variations of this kind are so common among the Collembola that colour is scarcely of any diagnostic value at all.

The most striking feature of the Collembola is the leaping apparatus to which they owe their popular name of Springtails. This apparatus is not characteristic of all the Order, however, for there are a good many species without any springing device at all, and in others it is so poorly developed as to be inoperative; but the majority are active jumpers. The apparatus, which is known as the furcula, consists of a forked appendage, (the dentes) hinged by a broad base, (the manubrium), to the belly at the fourth abdominal segment,

and is normally folded under the insect with the free forked end towards the head. The dentes terminate in curious hooked and toothed pieces (the mucrones) plainly designed to give the insect a firm purchase for its leap; and with the same object in view, the underside of the dentes are often studded with spike-like setæ. The acme of stinginess is reputed to have been reached by a man who used a wart on the back of his neck for a collar botton. Without accusing the springtail of parsimony, it must be stated that it adopts much the same means to hold its furcula in place. On the third abdominal segment is a curious little double-fingered protuberance (the tenaculum) which, when the furcula is folded in place, projects between the dentes. The fingers of this excrescence each provided with three or four teeth to ensure a firm grasp—bending outwards against the dentes, serve to hold the furcula close along the belly, where it is under considerable tension from the muscles of the manubrium. When the fingers of the tenaculum are relaxed, these muscles pull the furcula strongly downwards and backwards, and the insect is flung upwards into the air. Anyone who remembers that homely toy, the goose-bone jumping jack, that used to delight the children of a past generation, will readily understand how a springtail leaps.

The length of a jump may be as much as five or six inches. An *Achorutes socialis*, one millimeter long, easily springs four inches or 100 millimeters, and *A. socialis* is by no means one of the most active species. In proportion to the size of the insect, these are prodigious leaps. It is as if a man could cover a mile in nine or ten bounds.

While in the air, the insect folds the furcula back into place again, so that on alighting it is immediately ready for another leap, and it almost invariably comes down on its feet. Only a few species, however, such as *Tomocerus flavescens*, jump several times in quick succession. Generally there is an interval of half a minute or more between the leaps. And, as a rule, leaping is only resorted to in order to escape from danger. The usual mode of progression is walking or running by means of the legs; although the migrating kinds when on the march, keep leaping from time to time, but apparently largely at random.

While the springing apparatus is the most noticeable structure of the majority of the Collembola, it is not the distinguishing mark of the Order, for, as already mentioned, a good many species are entirely without it. It is the possession of the mysterious organ known as the "ventral tube" that decides the springtail lineage. This organ, situated ventrally on the first abdominally segment, is in some species merely a cleft tubercle, the sides of which open back like the jaws of a steel trap, exposing a wet, stickly-looking disc within. In other species it takes the form of a relatively long, projecting tube, from which (among some of the Symphypleona) can be protruded two lengthy, slender, transparent filaments, thickly studded with circular glands.

Dissection does little to explain the use of the organ, but Sir John Lubbock named the order Collembola—literally "glue-insertion"—from the idea, common to most entomologists of his day and apparently still held by some writers, that the ventral tube enabled "the creature to attach or glue itself to the body on which it stands." That this is the special function of the organ seems very doubtful. Springtails do not appear to be in any particular need of attaching themselves so securely to surfaces. They do not habitually live upside down,

nor are they especially exposed to shocks that might shake them loose from their hold. And Guthrie is mistaken in saying that their feet are not well adapted for smooth surfaces. It is true that the feet are lacking in any kind of a pad or sucker; and it is not likely that the two or three clubbed or geniculate setæ—the so-called tenent hairs—that in some species project over the usual pair of curved pointed claws, are anything more than tactile in function. But however they manage it, the thirty or forty species that I have observed in life, whether with two claws on each foot or only one, and with or without tenent hairs, could all run nimbly on dry, polished glass, even back downwards; and such a surface is infinitely harder and smoother than any they ever encounter in their natural habitat.

In support of his opinion that the ventral tube is an organ of attachment, Lubbock says that if a Sminthurus is laid on its back and a piece of glass is brought within its reach, "the animal will endeavour to seize it with the feet, but at the same time it will project one or both of the ventral tentacles and apply it, or them, firmly to the glass, emitting at the same time a drop of fluid which, no doubt, gives a better hold." This surmise may sound plausible in the particular instance, but an extended observation of the actions of different species as regards the ventral tube leads to another view of the probable function of the organ.

The Collembola are all extremely sensitive to any lack of humidity in their surroundings. Most species, if put into a dry vial, will die and begin to shrivel up within an hour. The only way to keep them alive in captivity for any length of time is to put in the vial some source of moisture such as wet, rotten wood or damp filter paper. Evaporation through the thin epidermis is so rapid, that it appears not unlikely to me that the ventral tube has to do with supplying or regulating the large quantity of moisture the insect requires.

This conjecture seems to be borne out by the conduct of more than one species For instance, a yellow Papirius—(a genus closely related to the Smynthurus mentioned by Lubbock) found in the autumn under dead leaves of hardwood forests, stands high on its legs, neither its ventral tube nor any other part of its abdomen normally touching the surface it rests on. In a vial, it has no trouble in walking on the glass in any position; and it remains for hours and even days clinging to the glass, back downwards, by its feet alone, maintaining its hold without any help whatever from the ventral tube.

Of a dozen or so of this species kept in a vial with the usual morsel of moist, rotten wood or damp filter paper, the majority remain thus motionless for long periods. Then suddenly, with startling swiftness, one of them shoots out its ventral filaments on either side of its body, and applies them closely to the glass along their whole length, always—so far as I have observed—where there is a film of moisture on the glass. The filaments, which are tubular and provided with a number of sucker-like glands at the ends, are longer than the insect's entire body, but are evidently stowed away by the smaller apical half telescoping into the larger basal section. After leaving the filaments in contact with the glass for a minute or two, the insect draws them in as swiftly as it shot them out, changes its position slightly, and darts them out again. This performance may be kept up for ten minutes or so, and then finally drawing in the filaments permanently, the insect lapses into quietude again.

This Papirius makes use of its ventral filaments also when washing itself, which it does frequently, very much like a cat. From its mouth it exudes a small, bright drop of liquid, and taking it on the claw of one of the forelegs—where it looks like a gleaming boxing glove—it rubs it briskly over its antennæ, head and legs. Sometimes it transfers the drop to the claw of one of the second pair of legs so as to reach farther down the body. The drop often remains unbroken during these proceedings, and with laudable economy, is then returned to the mouth and swallowed again. The washing operation almost invariably ends by the swift extrusion of a short piece of one of the ventral filaments, which is also apparently rubbed over with the remains of the drop; or moisture is transferred between it and the mouth. But the action is so rapid that I have never been able to make out exactly what occurs.

Guthrie observes of *Orchesella zebra*, which one morning after a shower he found in great numbers on the moist surface of stumps in the woods, that "they moved about fitfully at time, but often stopped and squatted down to bring the ventral tube into contact with the moisture." And some additional light is thrown on the use of the organ by watching the conduct of *Achorutes socialis* Uzel in a vial. The ventral tube in this species is simply a low cleft protuberance, which on opening, exposes a wet, sucker-like disc. When the vial containing a number of newly caught *A. socialis* is laid on its side, the insects first run around busily in every direction, maintaining their hold on the glass in every position without any assistance from the ventral tube. But every now and then, one of them opens the tube, and applies the disc to the glass. It still keeps its legs going, but now can only drag itself along slowly, as the attachment to the glass greatly impedes its way. In a few moments it withdraws the disc—sometimes leaving a trace of moisture on the glass,—closes the tube, and runs off briskly as before, only to repeat the action a little later on. After awhile, the insects quiet down, and come to rest closely packed side by side all around the circumference of the bottle. Many of those that are hanging back downwards are seen to have the ventral tube applied to the glass; but this cannot be merely for support, for the insects resting on the lower side of the bottle, where no attachment is necessary to maintain their position, are found, with few exceptions, to have their tubes in contact with the glass also. And a few hours later the still, motionless insects all around the bottle are discovered to be holding by their feet alone, with their ventral tubes without exception all closed.

To me, the evidence points strongly to the conclusion that the ventral tube is not primarily intended to maintain the insect's hold, and the probability is great that it acts as a kind of regulating valve, controlling and supplementing the supply of moisture.

Nor does the suggestion that the ventral tube is a breathing organ seem any better founded than the "attachment theory." The fact that the Collembola—with the exception of one or two genera of the Symphypleona—are without air tracheæ might seem to lend weight to the hypothesis. But Sminthurus and one or two others which alone have a tracheal system, also have the most highly developed type of ventral tube with long, extensible filaments, and it is against all the economy of nature that two distinct sets of apparatus should be provided for the same purpose.

In addition to the conspicuous organs we have been discussing, the Collembola display several minor structures that no doubt are sense organs of some kind, but what their precise functions are, and indeed what senses the insects really possess, we can only guess. Many species seem to get along quite well without sight, and the eyes of those endowed with vision are very simple constructions compared with the enormous compound eyes of some of the flying insects. The sense of touch—the most primitive of all the senses, and common to every manifestation of life—is doubtless served by the numerous strange "hairs" that cover the insects' bodies as well as by the antennæ. The very necessary sense of taste it is reasonable to suppose is situated in the mouth. And possibly the closely-allied sense of smell has its seat in the curious depressions each with a "peg" in the centre that sometimes indent the sides of the antennæ, or in the remarkable buds and tubercles often seen on the same organs. But it is hard to divine the use of the strange bladder-like sac that *Achorutes armatus* Nic. can evert from between its last two antennal segments. Equally mysterious are the "post-antennal organs," those rosettes of scales situated on the head between the base of the antennæ and the eyes in many species. They may be auditory, but, of course, we have no evidence that the insects can hear at all. Another peculiar feature of certain species are the two or three sharp, curved spines that grow out of the last abdominal segment. But whatever use these "anal horns" are to the animal, at least they justify their existence to the puzzled entomologist by helping him in the often difficult task of determining the species.

As the systematic observation of such minute insects in their habitat is practically impossible, and as it is very difficult to keep them in captivity under natural conditions, the details of their life-history are not well known.

The Collembola pass through no larval stage, and undergo no metamorphosis whatever. The white or yellow spherical eggs, about one-eighth of a millimeter in diameter, are generally quite smooth, although Nicolet figures some hairy ones. They are laid singly or in masses like bunches of grapes under bark, among dead leaves and in many other damp situations. The masses often contain from 50 to 100 eggs, and bulk much larger than the body of the insect, but are usually all stuck together with every appearance of being the product of one female. Oviposition apparently takes place only in the dark. Several species lay eggs freely in captivity, but I have never been able to observe the operation; and an English writer says that in 50 years' study of the insects he has never succeeded in seeing how the eggs are laid. Until some one discovers how to circumvent this coyness of the mother springtail, we shall not know whether, despite appearances, more than one female contributes to the egg cluster, or whether we must accept the decidedly improbable suggestion that the eggs increase in size after laying.

Incubation at room temperature takes from 10 to 35 days, according to the species. The large variation in the size of individuals of the same species taken at the same time points to more than one brood in the season, but they are so difficult to rear that exact data on this point are lacking. In captivity, *Achorutes socialis* Uzel and some other species lay only in the spring, while

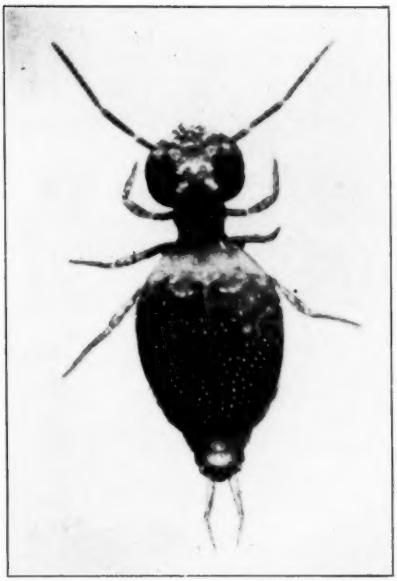
Achorutes humi Folsom and *Neanura muscorum* Templeton oviposit late in the fall. The eggs of the last-named took 35 days to hatch at an average temperature of 60 F. This is a remarkably long period compared with the 10 or 12 days required by the eggs of *Achorutes socialis* under the same conditions; and in the insects' natural habitat incubation would doubtless have been even longer, for the young Neanura appeared in my bottles on the 8th January; and in their native wilds, sheltered from the intense frost only by the bark of a rotten log, it is scarcely likely that they would have hatched before spring.

On emergence from the egg, the young of a two millimeter adult are about one quarter of a millimeter long, and are invariably white, with—except in the blind species—conspicuous black eye spots. They are perfectly developed, but are not of quite the same proportions as the adults,—being somewhat shorter and thicker—and are wonderfully active runners and jumpers. Their growth seems to be slow, but it is scarcely safe to generalize on this point from the progress of the young in captivity, for they do not thrive under artificial conditions. *Achorutes socialis* and *Achorutes packardi* captured when well grown, have lived for six to eight months in my vials, and it was more than a year before senile decay carried off *Xenylla maritima*. But though I have seen the young of half a dozen species hatch out, not one of them ever survived longer than two or three weeks; and during this brief life I could never notice any marked change in their appearance.

Some species at least are sexually mature a good while before they attain their maximum size. *Achorutes socialis* reaches a body length of two millimeters, but specimens only one and a quarter millimeters long lay eggs. The number of moults, so constant with many insects, is I suspect with them indefinite, for they seem to keep on shedding their skins and growing as long as they live. The largest sized specimens of several species that I am familiar with are found only in the spring. Apparently belonging to some brood of the year before, in spite of the almost sub-arctic cold of this district, they have continued to grow all winter in their shelters under the snow.

Their food seems to consist of organic matter of almost any kind. They have been found feeding on dead molluscs, fish and birds along the shore, but probably vegetable substances supply most of their nutriment. The mandibulate mouth-parts possessed by the majority are obviously designed for chewing. Some of the species I have had under observation fed on rotten wood, moss and lichens; others—notably the Arthropleona—would not eat at all in captivity.

No matter how small you are, trouble won't overlook you, and even the minute springtail has its enemies. Lubbock and some others refer to the presence of Protozoa in the internal organs of Collembola, and Imms found Nematodes in *Anurida maritima*. Nor are external parasites wanting. Of twelve or fifteen specimens of a small Sminthurus I collected last summer in the long grass of a beaver meadow, five had still smaller red mites firmly attached to them. This genus seems to be subject to attack by mites, for Lubbock mentions the same occurrence in connection with *S. fusce* (L.). Other likely enemies of the Order are the tiny spiders and chelifers, the thread-legged bugs and other predaceous creatures that one often finds in the collembolan habitats.



SMINTHURUS HORTENSIS FITCH.

An example of the sub-order Symphypleona.
(See p. 73.)

NEW PSAMMOCHARIDÆ AND PHILANTHIDÆ.

BY NATHAN BANKS, CAMBRIDGE, MASS.

The following new species are mostly from the northern and northwestern parts of the United States or from Canada.

PSAMMOCHARIDÆ.

Psammochares lasiope, n. sp.

♀ Black, basal part of abdomen reddish above and below, extreme base of first segment black. Head, pro- and metanotum densely clothed with rather long hairs. Clypeus truncate, margined; antennæ slender, second plus third joints fully equal vertex width, vertex from in front hardly convex; the lateral ocelli nearer to each other than to the eyes; hind border of pronotum angulate; base, tip, and venter of abdomen with few fine hairs, no bristles near tip of abdomen; legs slender, with short spines, three in comb on basitarsus, not very long; inner spur of hind tibia about one-half of the basitarsus. Wings nearly uniformly blackish, but not very dark; second and third submarginals subequal in size, both broad above, separated by a vertical vein, and receiving the recurrent veins near the middle; basal vein before transverse; in hind wings the fork is interstitial with the end of the cell.

Length 11 mm.

From Saranac Lake, 26 Aug.; Wilmington, 20–26 Aug.; New Russia, Essex Co., 18 Aug., all in New York, (Bradley). Differs from *atlanticus*, *autumnalis*, *marginalis*, in having longer hair on metanotum and broad-topped third submarginal cell; the spines of the comb are about the length of those in *marginalis*, much shorter than in *autumnalis* and *atlanticus*.

Anoplius depressipes, n. sp.

♀. Deep black throughout; wings uniformly black. The face is rather broader below than above, the clypeus very broad, nearly truncate below, but rounded at outer sides, vertex straight across, hind ocelli about as close to eyes as to each other, antennæ slender, second plus third joint equal vertex width; pronotum behind angulate, metanotum sloping, not very long, with a deep median groove, with long hair. Abdomen slender, basal and apical segments hairy above, all below; legs slender, not very spiny, those on the tibiæ hardly one-half of the width of joint, inner spur of hind tibia about one-half of basitarsus, anterior tarsi flattened, the outer edge angulate, concave below, no spines above on basitarsus, 2 in the concavity on lower outer side. Wings moderately long, second submarginal cell longer than wide, receiving the first recurrent beyond middle, third submarginal fully as long as the second, narrowed above, receiving the second recurrent vein near middle, latter curved, basal vein a little before the transverse; in hind wing the fork interstitial with the end of the cell. The head and thorax are clothed with rather long hair.

Length 12 to 16 mm.

From Ithaca, N.Y., 12 July (Needham); Spring Creek, Decatur Co., Ga., 16 July, (Bradley) and Burton, Ga., 21 May, (Bradley).

The nature of the anterior tarsus, especially the basal joint, will distinguish it from our other species of this genus.

Anoplius similaris, n. sp.

♀. Black throughout; wings uniformly black. Closely to *A. illinoiensis.* The clypeus is broadly, evenly concave below, in *illinoiensis* it is truncate and consequently longer. The face is a little broader at vertex than in *illinoiensis;* antennæ and ocelli about the same as in that species; the metanotum is a little shorter, more deeply grooved, the posterior slope more flattened across, the hairs shorter and much fewer than in *A. illinoiensis.* The abdomen similar but the last segment has only a few fine hairs, not the stiff bristles of *A. illinoiensis.* Legs slender, hardly as spiny as in *illinoiensis,* the inner spur of hind tibia a little more than one-half of basitarsus; the front basitarsus has no noticeable spines above, but two or three on the outer under side. Venation similar to *A. illinoiensis,* but submarginal cells a little larger, and the second recurrent vein not curved.

Length 15 to 16 mm.

From Ithaca, N.Y., 14, 25 July, (Bradley).

Lophopompilus autilone, n. sp.

♂. Related by the male genitalia to *L. æthiops,* differs in that there is a median, hairy ridge the whole length of the genital plate (in *æthiops* only at base). The under side of the first joint of the antennæ is hardly hairy; the hairs on the metanotum are not nearly as long or as dense as in *æthiops,* and the whole body is less hairy. The clypeal margin is slightly concave; the third submarginal cell is triangular, receiving the second recurrent vein near the middle, the latter bent near the middle; hind margin of pronotum almost angular; apical ventral segments with scattered hairs only.

Length 14 mm.

From La Belle, 8–10 May, Ft. Meyers, 7 May, Florida, and Billy Island, Okefenokee Swamp, Ga., all taken by Prof. Bradley.

Pompiloides canadensis, n. sp.

♀. Similar to *P. cylindricus* and *P. insolens;* differs from both by the shape of the basal plate of male genitalia being triangularly emarginate, the sides of the emargination divergent (instead of parallel); the last ventral segment is not so deeply emarginate behind as in *P. cylindricus.* Black throughout, not as much silvery as in *P. cylindricus,* the silvery appearance noticeable on face, thorax and coxæ. Head with rather longer hair than *P. cylindricus,* venter with few, but distinct hairs. Third submarginal cell usually short petiolate, the second sub-quadrate. About the size of *P. insolens.*

From Truro, Nova Scotia, 12 Aug., (Matheson); and Val Morin, 29–30 July, Canada (Ouellet).

Sophropompilus quadrispinosus, n. sp.

♀. Deep blue; wings blackish, nearly uniform, legs and antennæ black; clothed with short hairs. Clypeus truncate, third antennal joint hardly equal first, faint line to anterior ocellus, hind ocelli nearer to each other than to the eyes, vertex from in front slightly convex, pronotum arcuate behind; metanotum short, hairy, faint groove on the base; abdomen with short hairs above, longer at tip and below; femora plainly hairy above, inner spur of hind tibiæ two-thirds of the basitarsus, front tarsus has four long spines in comb on the first joint, these are almost flattened; wings and venation as in *S. hyacinthinus.*

Length 10 to 12 mm.

From Long Beach, L. I., N.Y., Aug., (Shannon); Chesapeake Beach, Md., 18 to 21 Sept.; Gulfport, Fla., April, (Reynolds); Billy's Island, Okefenokee Swamp, Ga., 1 to 5 Sept., (Bradley), and Tybee Island, Ga., (Bradley); evidently a coastal species. Body and legs more hairy than *hyacinthinus*, and with longer comb, four on first joint.

Ageniella eximia, n. sp.

♂. Black, apical parts of legs more brown; wings slightly fumose, not darker on tips. Small and very slender; face rather broad, hardly narrowed below, lateral ocelli plainly nearer to each other than to the eyes; pronotum behind strongly arcuate, metathorax sericeous on its sides. Abdomen very slender, basal segment about one and a half times longer than broad at tip; inner spur of the hind tibia little more than one-half of the basitarsus. Wings slender, rather short, marginal cell not its length from wing-tip, third submarginal higher than long, slightly narrowed above, receiving the second recurrent a little before middle, basal vein a little before the transverse.

Length 3½ to 4½ mm.

From Falls Church, Va., Ithaca, N.Y., 15 July to 10 Aug., (Bradley), Albany, and McLean, N.Y., 3 July.

Related to *A. iridipennis* Cress., but very much smaller, darker spurs and front legs, and slightly different in venation. Several specimens have the apical part of hind femora reddish, but otherwise agree.

Agriogenia, n. gen.

Based on *Agenia brevis* Cress. It agrees in general with *Ageniella*, but differs in being clothed with a fine, appressed, greyish yellow pubescence; the legs, especially the femora, are shorter and stouter than in *Agenia*, and the shape of marginal cell and third submarginal was noted by Cresson. The female, however, has on the underside of the head back of the mouth a curved row of long white bristles which look as though arranged to hold food. Nothing similar occurs in *Ageniella;* the head is flatter in the frontal region than in *Ageniella*.

PHILANTHIDÆ.

Cerceris completa, n. sp.

Male from Claremont, California, (Baker). Black, with yellow marks; face below antennæ, base of mandibles, stripe on scape beneath, spots on pronotum, the postscutellum, and legs (except basal two-thirds of femora, yellowish. Basal segment of abdomen black, second yellow above, with a median transverse black spot, pointed at each side, the following segments yellow with large basal, transverse, black spot, that on the third and fourth segments narrowed at extreme base; the venter with pale bands on second, third and fourth segments broader on sides, fifth with spots on side. Clypeus truncate in middle below; hair lobes small; enclosure smooth and shining; first abdominal segment plainly longer than broad, and not one-half the width of the second; other segments broad; pygidial area once and two-thirds longer than broad at base, rather broader at base than elsewhere. Body rather finely and densely punctate; head, thorax, and first segment plainly hairy; stigma yellowish.

Length 11 mm.

Cerceris snowi, n. sp.

Males from Tucson, Arizona (Snow) and San Diego Co., Cal., (Van Duzee). Black; lateral face marks, scape beneath, two spots on pronotum, the postscutellum, tegulæ, apical bands on the second and following segments, cream yellow, those on face nearly white; band on second segment much broader than others which are narrow and may be broken each side; tibiæ and extreme tips of femora pale, a dark spot behind on mid and hind tibiæ, the basitarsi pale. Flagellum of antennæ rather rufous beneath, especially toward tip. Face below densely white-haired; clypeal margin at middle faintly tridentate; enclosure smooth; the pygidial area elongate, about as in *C. kennicotti.* Head, thorax, first and second segments very plainly hairy. One specimen has two small spots on first segment, two have faint lateral spots on the scutellum.

Length 8 mm.

By small size and coarse punctuation related to *C. erigoni* and *C. acanthophila,* but distinct by having clypeus all black.

Cerceris interjecta, n. sp.

Male from Lake Point, Utah, 18 July, (Titus).

Black marked with yellow; first abdominal segment red above and below. Face with middle clypeal spot not reaching lower margin, and lateral spots yellow, sides of clypeus and the mandibles black; basal part of flagellum slightly rufous beneath; two spots on pronotum, the postscutellum, and broad abdominal bands, yellow, that on the second segment occupying one-half of the segment, not emarginate; third, fourth and fifth broadly emarginate in front, but on sides reaching the front margin of the segment, sixth with a small basal, median dark spot; venter all black; legs black, the tibiæ yellow in front, tarsi dark brown; stigma yellowish; pygidium mostly rufous. Face very broad; clypeal margin slightly rounded, hair-lobes very small; last joint of antenna as long as preceding, slightly curved; enclosure large, smooth, polished; pygidial area once and one-half longer than broad, sides nearly parallel. Body moderately, coarsely punctate; abdomen broad, basal segment.

Length 10 mm.

Cerceris abbreviata, n. sp.

Males from Yakima River, Little Spokane, and Umatilla, Washington, June and July, (S. Henshaw).

Black, marked with yellow, face, base of mandibles, scape beneath, dot behind eyes, pronotum, tegulæ, postscutellum, two spots on basal segment, narrow bands, all about of the same width on following segments, yellow; three pairs of ventral spots, usually connected; legs yellow, front and mid femora with black spot near base, hind femora and tibiæ black near tips; stigma yellowish; flagellum rufous beneath, last joint of antenna rufous, slender, curved. Face is narrower than *C. occipitomaculata,* the lateral lobes of clypeus being proportionately higher. Clypeal margin truncate; enclosure plainly longitudinally striate, but on sides more oblique; basal segment of abdomen very broad; pygidial area elongate, the sides parallel; head and thorax short-haired.

Length 8 mm.

In appearance a *C. nigrescens* marked with bright yellow instead of white, but a slightly smaller, and shorter bodied species.

Philanthus yakima, n. sp.

Washington—Yakima, 2 to 4 July, 1882, (S. Henshaw).

♀. Close to *P. flavifrons*, but smaller. Face, mandibles, scape beneath, streak behind eyes, two dots on vertex, collar, tegulæ, tubercles, spot behind, larger spot below, spot at posterior corners of mesonotum, adjoining spot each side on base of scutellum, postscutellum, spot each side on metanotum, broadly interrupted bands on first and second segments, bands on others, broad on sides, very narrow in middle, that on third deeply indented each side behind, broad bands on second, third and fourth ventral segments, all yellow. Legs (including coxæ) yellow, basal part of femora, rather more than one-half on hind femora, and spot toward tip of hind tibia black. Underside of flagellum rufous; stigma yellow. Punctured as in *flavifrons*, striately on front, few on mesonotum, rather deeply and evenly scattered on abdomen, but hardly as large as in *flavifrons*. Differs from *flavifrons* in that the enclosure has the posterior as well as lateral margins raised and smooth, making a horse-shoe-shaped area. The last dorsal segment is broadly triangular, and the sides not concave toward tip as in *flavifrons*.

Length 10 mm.

FURTHER NOTES ON THE LATIMANUS GROUP OF THE BEE GENUS MEGACHILE.

BY F. W. L. SLADEN, APIARIST, DOMINION EXPERIMENTAL FARMS.

In the Agricultural Gazette of Canada, February, 1918, page 125, I proposed the name *diligens* for *Megachile latimanus*, Ckll. not of Say. Professor Cockerell has informed me that the name *diligens* was given by F. Smith in 1879 to a *Megachile* in the Hawaiian fauna, so that it becomes necessary to find a new name for *latimanus* Ckll., and I propose *dentitarsus*. The difference between this and the other Canadian species of the *latimanus* group were pointed out in my table given in the Canadian Entomologist, September, 1918, page 302. There is, however, another character to which Professor Cockerell has called my attention. When the abdomen is viewed from above and slightly tilted, black hairs are prominent laterally in *dentitarsus* (*latimanus* Ckll.), but no black hairs project at side in *perihirta*, Ckll. (*grindeliarum* Ckll.).

OCCURRENCE OF THE PEAR THRIPS IN ONTARIO.

BY WM. A. ROSS, DOMINION ENTOMOLOGICAL LABORATORY, VINELAND STA., ONT.

The notorious pear thrips *Tæniothrips inconsequens* Uzel, hitherto unrecorded in Ontario, was taken by the writer last spring (1918) on pear trees in a large orchard near Beamsville. Fortunately the thrips was present in very small numbers and apparently was not causing any appreciable injury.

Thanks are due to Mr. P. J. Parrott, of the Geneva Agricultural Experiment Station, and Capt. J. D. Hood, Washington, D.C., for confirming the identification of this insect.

For the information of the reader it should be stated here that an excellent, detailed account of the known distribution, life history, habits and control of the pear thrips is given by A. E. Cameron and R. C. Treherne, of the Dominion Entomological Branch, in Bulletin No. 15—"The Pear Thrips and Its Control in British Columbia."

NOTES ON THE LIFE-HISTORY AND EARLY STAGES OF BRACHYS OVATUS WEB., AND BRACHYS AEROSUS MELSH.

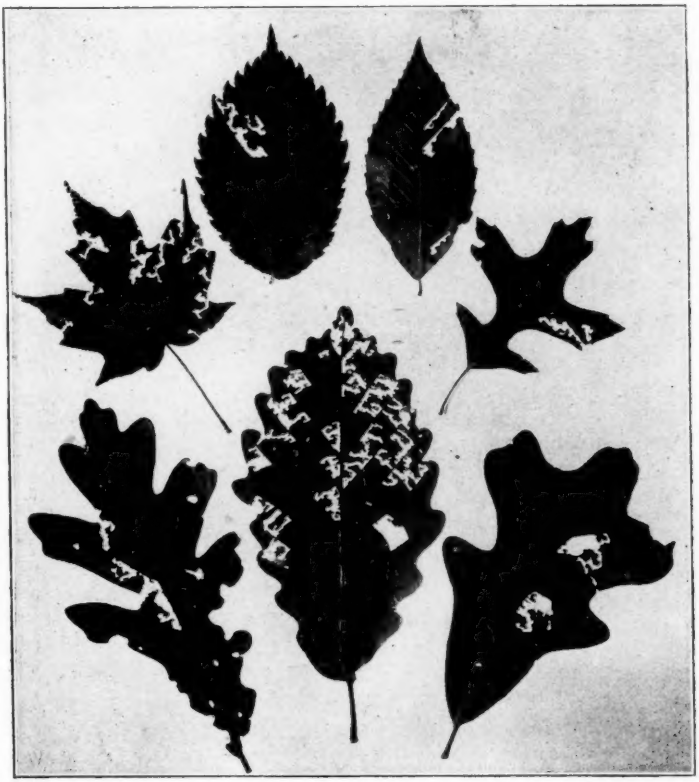
BY HARRY B. WEISS AND ALAN S. NICOLAY, NEW BRUNSWICK, N.J.

Packard in his "Forest Insects" records *B. aerosus* as occurring on oak early in summer in Maine and late in May near Providence, R.I., and states that Gillette (Canad. Ent. July, 1887) reared it from larvæ in poplar leaves, the mines being finished in October and the beetles appearing early the following May. Concerning *B. ovatus*, this species is recorded by Packard as follows "on laurel oak; imago issues latter part of April and early May (Riley's unpublished notes)." Gillette also reports rearing the beetle from a larva mining a leaf of either red or black oak. Felt (N. Y. State Mus. Mem. 8; 2, p. 512–3) states that *B. aerosus* was taken while feeding on elm during the latter half of May, and that *B. ovatus* was common on scrub oak the latter part of May and June. Blatchley in his "Coleoptera of Indiana" records *aerosus* as throughout the state, frequent, May 16–June 18, occurring on oak, hickory, elm and *ovatus* also as throughout the state and frequent, May 16–July 13, on oak in the leaves of which the larvæ dwell. According to Smith (Rept. N. J. State Mus. 1909) *aerosus* is found throughout New Jersey, not rare, on oak, May, June and *ovatus* is common throughout the state, June to August on oak. Burke (U. S. Dept. Agric. Bull. No. 437, 1917) summarizes the distribution, common habits and host trees of the genus *Brachys* as follows:—"Eastern and Central States, leaf miner in leaves: *Populus* ?, alder (*Alnus*), *Fagus* ?, chestnut (*Castanea*), oak (*Quercus*), *Ulmus* ?, and *Acer*?"

In New Jersey, we have found the distribution of both species to be as reported by Smith, and have observed the adults feeding on foliage as follows: *B. ovatus* on elm (*Ulmus americana*), sugar maple (*Acer saccharum*), white oak (*Quercus alba*),chestnut oak (*Q. prinus*),pin oak (*Q. palustris*), chestnut (*Castanea dentata*), scrub oak (*Q. ilicifolia*), black oak (*Q. velutina*), post oak (Q. *minor*), beech (*Fagus ferruginea*), and hickory (*Hicoria glabra*) with the various species of oaks as preferred food plants; *B. aerosus* feeding on beech (*F. ferruginea*), linden (*Tilia americana*), witch hazel (*Hamamelis virginiana*), elm (*Ulmus americana*), chestnut (*C. dentata*), sugar maple, (*A. saccharum*), red maple (*A. rubrum*),and various species of oaks with the oaks as preferred food plants, although quite a few adults were taken while feeding on red maple and beech.

The feeding of both species is quite characteristic. The beetles feed on the upper leaf surfaces usually near the edges consuming the tissue between the larger veins and working, as a rule, along a large vein. This habit results in feeding areas which are bounded on one or more sides by straight edges or lines giving the injury a sort of ragged geometrical appearance. After much feeding has been done at one spot, the small amount of remaining uninjured tissue weathers away in the course of time, resulting in irregular holes.

The mines of both species are somewhat irregular and blotch-like and may be found on any part of a leaf, the majority, however, occurring near the edge. As a rule each mine contains only one larva, and is found on a leaf which is comparatively uninjured by adult feeding. *Aerosus* mines take up only a small portion of a leaf, while an *ovatus* larva will frequently mine one-half or more of a medium-sized leaf. The mines of both species are visible on both leaf surfaces, more so on the upper where they appear as brown dead spots or areas. Some



VARIOUS LEAVES SHOWING BRACHYS, SP. FEEDING.

leaves when held up to the light are so mined that the characteristic larva is readily identified as a *Brachys* sp., while others have the mined area so brown that the light will not penetrate. However, a *Brachys* sp. mine can usually be identified as such by the dried, oval, flat, glistening egg shell which remains sticking to some portion of the upper surface of the mine long after the larva has left it. Mined leaves were found on small as well as large trees. On the large trees, however, only the outer leaves exposed to plenty of sunlight were infested.

Not all of the trees selected as food plants by theadu lts seem to harbour the larvæ in their foliage, and we have observed mines of both species only, as a rule, in the leaves of various oaks. In a few cases we have noted mines on chestnut and have taken larvæ therefrom. At Uhlerstown, Pa., eggs and adults of *B. aerosus* were plentiful on red maple leaves, but an opportunity for visiting this place later in the season was not afforded us, and it is not known if the leaves were mined.

In general, the life-history of both species is as follows. Adults appear about the middle or latter part of May and disappear by the first part of August, being most plentiful during June and the first part of July. Soon after emergence and feeding, eggs are deposited on the upper leaf surfaces, many being laid near the edges. After hatching, the larvæ mine the leaves until the latter part of August and September, at which time many leave the mines through the lower surface and drop to the soil where pupation takes place. Sometimes it is possible to find larvæ in their mines as late as the middle of October. The winter is evidently passed in the pupal stage, as a specimen under our observation pupated during the first part of October.

Egg of *B. ovatus*. Length 2.2 mm. Width 1.7 mm. Flat, oval, rounded at both ends. Side resting against leaf flat. Upper surface slightly convex. Chorion apparently smooth, shining. Transparent when first laid, later becoming yellowish white. Just before hatching larva can be seen through the transparent chorion, resting with the abdomen bent back sidewise upon itself the tip touching the second thoracic segment. Except for its smaller size, (Length 1.7 mm., width 1.1 mm.,) the egg of *B. aerosus* appears to be similar to that of *ovatus*.

In depositing the egg, the female protrudes the tip of the vagina slightly and rubs it back and forth against the leaf surface. This operation which ends in three or four minutes results in an oval, flat, transparent, watery-like mass, the outer surface of which soon hardens into a thin film or skin. The entire thing resembles an oval drop of transparent, watery excrement rather than an egg.

Of a pair of *B. ovatus* collected May 27 and placed in a cage, the female deposited sixteen eggs. A pair of *B. aerosus* collected at the same time and caged resulted in the female depositing forty-five eggs. Another pair of *aerosus* yielded thirty-five eggs. Inasmuch as no eggs were noted in the field when the specimens were collected, these numbers may be fairly representative. All of the above specimens lived and fed for six weeks, the eggs being deposited during the first four. All eggs were deposited on the upper leaf surface, many of them close to the edges. As a rule, leaves uninjured by adult feeding were selected. The young larva usually enters the leaf tissue directly beneath the egg and mines

either in an irregular area around the egg or in a gradually widening, elongate area away from the egg and parallel to and against the leaf edge.

Practically all of the *ovatus* eggs in our cages and many in the field were parasitized by *Closterocerus cinctipennis* Ash. In the cage containing forty-five *aerosus* eggs, nineteen mines were started, 17 eggs were parasitized and nine appeared to dry up. In the cage containing thirty-five *aerosus* eggs, ten mines were started, fifteen eggs were parasitized, and ten failed to hatch for some reason or another. Most of the larvæ which started the mines were also parasitized by the same species. Parasitized eggs became black in colour and many such were noted in the field. A few good eggs were noted as late as July 15, showing that egg deposition evidently extends over a considerable period.

FULL GROWN LARVA OF *B. ovatus*. Length 7 to 9 mm. Width of first thoracic segment 2.4 to 2.85 mm. Slightly wedge-shaped, much flattened. Body composed of thirteen well-defined segments which are deeply notched and lobed. Head and mouth-parts dark. Head more or less retracted into first segment. First segment as broad or slightly broader than the following, body gradually tapering to the twelfth segment. First segment with large, well-developed, comparatively smooth, shining, subquadrate plate on both dorsal and ventral surfaces. Dorsal plate with median line groove. Abdominal segments one to seven with pronounced rounded lobes. Lobes of abdominal segments five to nine each bearing a group of several stout, minute spines. Posterior dorsal edge of eighth abdominal segment fringed with row of minute, stout spines. Colour whitish, broad median dorsal line indicated on abdominal segments one to eight. Lateral dorsal portion of each body segment except the first varies from light gray in some specimens to black in others. (Immature specimens are entirely whitish). Entire dorsal surface except plate of first segment covered with somewhat slightly raised dots. These are more apparent laterally and bear the dark colour. Ventral surface somewhat similar to dorsal. Entire lateral surface of body sparsely hairy.

The larva of *B. aerosus* appears to be somewhat similar to the above, except that it is smaller (Length 4–5 mm. Width of first segment 1.53 mm.), and that the sides of the body appear to be slightly rougher, and the spines on the lobes of the fifth to ninth abdominal segments appear to be less pronounced.

PUPA OF *B. ovatus*. Length 6.7 mm. Greatest width 3.5 mm. Colour brown ochre (Nomenclature of Windsor & Newton's Water Colours). Shape similar to that of the adult. Surface smooth, shining.

This stage is probably passed on top of the soil in rubbish or under the surface of the soil. Many mines were examined in the field, but no pupæ were ever found. It was noted that in every case, the larva had made its exit through the lower surface of the mine. In our cages only one larva of *ovatus* pupated, and it did so on the surface of the soil. When full grown they left the mines, and for some reason or another all except one died on the surface.

Ovatus was described by Weber in 1801 (Observ. Ent., Vol .1), and *aerosus* by Melsheimer in 1846 (Proc. Acad. Nat. Sc. Phila., Vol. 2). There is some synonymy indicated, but this need not be gone into here.

OAK LEAF SHOWING INCOMPLETE MINE OF *BRACHYS OVATUS*.

The dark oval spot near the lower edge of the mine is the dried egg shell.

NOTES ON THE NORTH AMERICAN SPECIES OF CORIZUS. (COREIDÆ, HETEROPTERA).

BY EDMUND H. GIBSON, U. S. BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

After several months of studying long series of specimens representing each species that occurs in North America and many exotic species the author comes to the conclusion that no satisfactory results, as to the limits of each species, the systematic arrangement and relation of species, can be obtained from the mere examination of dried adult specimens, especially without an increased biological knowledge of the group. The writer, therefore, is forced to call tentative any remarks or deductions herein set forth until they are verified by results obtained from life-history and habit studies of each species. At the outset of the study it was the plan to revise the genus, but being forced to abandon this because of the above stated reasons, this paper resolves itself into more or less of a review of Hambleton's* treatise of the North American species, which has been the most notable contribution to our knowledge of the group.

In the first place attention must be called to the great similarity of this genus to the Lygæid genus *Nysius* Dall., which has often been a stumbling block for young students and general collectors. In the mind of the author *Corizus* represents a much degraded group of Lygæidæ and should be considered in that family rather than the nucleus of a subfamily of Coreidæ, or else it is the group that links Coreidæ with Lygæidæ and is sufficiently different from both to be considered the basis of a separate family (Corizidæ L. & S.) The chief point of difference between *Corizus* and *Nysius* lies in the character and form of the genitalia of both sexes. Also *Corizus* may be distinguished from *Nysius* by the lack of a prominent osteolar canal and simplified odoriferous orifice and in the much more produced scutellum.

From all evidence at hand I agree with several other hemipterologists that subgenera should not be recognized and hence the names *Liorhyrsus* Stal., *Stictopleurus* Stal., and *Niesthrea* Spin. go into synonymy with *Corizus*.

The following artificial key is offered as an aid to the identification of the species with the hope that numerous dubious points in Hambleton's key will be cleared up.

KEY TO THE SPECIES.

1. Antenniferous tubercles very long, approximating the length of the first antennal segment ..... *tuberculatus* Hambl.
   Antenniferous tubercles more or less prominent, but not long or approximating the length of the first antennal segment 2
2. Posterior border of metapleura not prominently expanded laterally, lateral posterior angles broadly rounding and receding from margin of abdomen 3
   Posterior border of metapleura more or less expanded laterally, lateral posterior angles usually acute, sometimes rounding but never receding from margin of abdomen 4
3. Species large, connexivum spotted ..... *crassicornis* Linn.
   Species small, connexivum unspotted ..... *viridicatus* Uhl.

*The Genus Corizus with a review of the North and Middle American Species. J. C. Hambleton, Annals Ent. Soc. Am., Vol. 1, No. 1, pp. 133-152, 1908

4. Last segment of abdomen short, truncate in female and evenly rounded in male as viewed from above ..... *hyalinus* Fabr.
   Last segment of abdomen comparatively long, rounded or pointed in female, not evenly rounded in male as viewed from above 5
5. Scutellum broad at apex, rounded or blunt 6
   Scutellum narrow at apex, pointed 11
6. Abdomen above distinctly marked transversely with black, second and sixth segments light coloured ..... *sidæ* Fabr.
   Abdomen not so marked 7
7. Last dorsal abdominal segment of female long and distinctly angulate, apex less than a right angle. Dark coloured species. Sternum black, connexivum of male spotted 8
   Last dorsal abdominal segment of female rounding, apex greater than a right angle 9
8. Female segment very acutely pointed, extremely long. Western species ..... *punctatus* Sign.
   Female segment not acutely pointed, Eastern species ..... *bohemanii* Sign.
9. Species small, robust, and dark coloured, mottled on underside of abdomen. Very hairy. Connexivum heavily marked ..... *parvicornis* Sign.
   Species larger, generally lighter coloured, not so hairy. Underside of abdomen not mottled. Connexivum only slightly marked if at all 10
10. Species medium sized to small ..... *lateralis* Say
    Species much larger ..... *lateralis* var. *validus* Uhl.
11. Postero-lateral angle of metapleura greatly produced. Antennæ short, last joint comparatively stout. Wings not extending to end of abdomen. Species small and robust. Densely clothed with fine long hairs ..... *hirtus* Bueno
    Not as above 12
12. Sternum black. Small species ..... *indentatus* Hambl.
    Sternum not black. Larger species ..... *scutatus* Stal.

C. hyalinus Fabr. is a well-defined species and readily distinguished from all others by the shape of the last abdominal segment in both sexes. It is cosmopolitan in its distribution, and is the logotype of the genus. I am unable to separate by structural characters the various varieties as listed in Van Duzee's catalogue.

C. tuberculatus Hambl. should not be confused with any other species. The very greatly produced antenniferous tubercules serve to distinguish it. In general appearance it greatly resembles *indentatus* Hambl., *punctatua* Sign., and *bohemanii* Sign. This is a western species, records show it occurs from Washington and Idaho south through Oregon, Nevada and California.

C. hirtus Bueno is the smallest species in the genus, and appears to be somewhat of a degenerate form of *parvicornis* Sign. The elytra are usually much shortened and appear undeveloped. It is probably limited in its distribution to the northeast.

C. parvicornis Sign. But little needs to be remarked concerning this species, its short, stout, form being quite characteristic. It is known to occur in Washington, California, Arizona, New Mexico, Texas, and southward.

C. punctatus Sign. The greatly produced and acutely pointed last abdominal segment of the female serves as a character to set this off from other species. However, in this respect the females of *bohemanii* Sign. approach *punctatus*, and I am unable to separate the males of these two species. *C. punctatus* is limited to the southwest, while *bohemanii* occurs over the entire eastern half of the United States. While for the time being it is wise to keep these two forms distinct and as separate species, yet the author surmises that one may be a locality form of the other, and at some future time with increased evidence it may be best to consider one a variety of the other.

C. bohemanii Sign. is probably the most common species found in the East and Central States. Typical specimens are extremely dark in colour. The last abdominal segment of the female is produced more than any other species except *punctatus* Sign.

C. scutatus Stal. is the largest species in North America, and occurs from British Columbia south into Mexico. Its generally large size and bluntly pointed scutellum will serve to distinguish the species. In colour it varies considerably. Typical specimens are dark with connexivum heavily marked.

C. indentatus Hambl. is a comparatively small form that can only be separated from *scutatus* Stal. by its size and the fact that its sternum is black while that of *scutatus* is normally light-coloured. Both are western species.

C. sidæ Fabr. is very variable in size and general colour, but is readily separable from the other species by dorsal transverse, black bands or markings on the third, fourth and fifth abdominal segments. This characteristic colour marking is always present, although in some specimens examined it has become less prominent or faded. Numerous specimens exhibit much reddish coloration. Some authors would undoubtedly establish numerous varieties based upon variations of colour and size, but the writer is prone to believe that such differences come from climatic and food conditions. A close study of the external anatomy of these so-called forms reveals no structural differences. I do not agree to the advisability of considering *pictipes* Stal. a distinct variety. It is also a cosmopolitan species.

C. lateralis Say occurs over the entire United States and southward. There are no outstanding features that will readily serve to separate this from other species. The process of elimination in the determination of species will apply to advantage. If specimens in question cannot be placed in other species they are usually called *lateralis*. The acutely pointed scutellum and lack of markings on the connexivum are generally used as diagnostic characters. It is very variable in size and colour, some specimens being quite dark or reddish and others entirely pale yellow. I am unable to separate Uhler's *validus* from *lateralis*, except in size and the slight colour markings on the connexivum. However, I have seen innumerable gradations in size from an extra large, so-called *validus* to a minute *lateralis*, and have been unable to separate them by structural differences. Also even some nearly typical *lateralis* will exhibit slight indications of colour markings on the connexivum. For the time being I consider it advisable to consider *validus* as a variety of *lateralis* until more biological evidence is at hand.

C. crassicornis Linn. and *viridicatus* Uhl. These two species form a group quite distinct from all other species, and can be most easily recognized by the

fact that the posterior margin of the metapleura is nearly truncate, being only slightly sinuate. The posterior lateral angles of the metapleura are broadly rounded in these two forms, while in the other species they are more or less produced and not receding from the lateral margin of the abdomen. There are other characters, such as the transverse suture of the pronotum ending in a loop, which Hambleton gives for separating these species, but the author considers the difference in structure of the metapleura to be of the most importance. *C. viridicatus* is smaller and lighter coloured than *crassicornis*, and does not have the range of distribution that the latter has. With further biological data the writer suspicions that *viridicatus* will have to be considered a variety of *crassicornis*, or may even be forced into synonymy with the latter.

C. crassicornis occurs over the entire northern portion of the United States, and in the west it is known to extend north into Canada and south into Mexico, It also occurs in Europe and Asia. *Viridicatus* has been recorded only from Iowa, Nebraska, Wyoming, Utah, Nevada, Colorado and New Mexico.

The writer disagrees with Hambleton's opinion that "the nature of the dorsal sutures between the third and fourth, and fourth and fifth segments of the abdomen is quite constant." The advisability of using this character in the separation of species is certainly risky. The characters of the genitalia should only be used in the separation of but few species.

For a full description and complete bibliography of each species reference should be made to Hambleton's paper and to Van Duzee's recently published and most excellent catalogue.

In closing the writer wishes to acknowledge the generous loan of specimens from Messrs. H. G. Barber, J. R. Bueno, C. J. Drake, R. W. Leiby, W. L. McAtee, and Rev. M. Wirtner, all of which greatly facilitated the study which in turn permits these preliminary remarks. These collections with that of the National Museum afforded long series in each species.

A NEW RACE OF *PLEBEIUS ICARIOIDES* FROM VANCOUVER ISLAND.

BY WM. BARNES, M.D., AND J. McDUNNOUGH, PH.D., DECATUR, ILL.

This variable species seems to have developed on the southern portion of Vancouver Island into a local and very characteristic race which, on the underside, has so much similarity to *pheres* Bdv. from the San Francisco region that it has frequently passed under this name, and is probably figured by Holland in his Butterfly Book (Pl. XXX, Fig. 37) as this species.

The most characteristic feature of this new race, however, is found in the colour of the blue scaling of the upper side; this is a distinct silvery-blue, much as in *saepiolus*, and easily distinguished from the violet or lilac-blue of the other *icarioides* races; we have at various times had single specimens before us for examination, but this year through the efforts of Mr. E. H. Blackmore, of Victoria, B.C., we have secured a fine and, in general, very constant series of both sexes; we take much pleasure in dedicating this interesting form to its discoverer, and describe it in detail as follows:—

P. incarioides blackmorei *var. nov.*

♂. Upper side brilliant silvery-blue; primaries with a blackish border, 2 mm. broad, along outer margin; secondaries with vague dark marginal spots,

surrounding which the blue is of a somewhat paler colour than on the remainder of the wing; a small patch without blue scaling at costal angle; terminal dark line; fringes on both wings with basal half blackish and outer portion white, except along abdominal margin of secondaries where they are totally white. Beneath both wings pale gray, sprinkled with greenish at base and suffused with whitish rather broadly along outer margin; primaries with the dark discal dash and postmedian row of spots reduced in size as compared with those of typical *icarioides* (Sierra Nevada region) but broadly encircled with white; subterminal spots obsolete; secondaries with a white lunate discal mark and a curved postmedian row of rather obscure white spots, very faintly centered with black dots; traces of faint whitish subterminal lunules; fringes white.

♀: Upper side deep black-brown, basal half of primaries scaled with blue; a narrow, black discal mark; secondaries bluish at base and along abdominal margin; a narrow, broken, bluish line along outer margin, behind which are traces of dark spots similar to those of the ♂, partially outlined by blue scaling; no red scaling. Underside very similar to that of the ♂, with slightly darker ground colour. Expanse, ♂ and ♀, 30 mm.

Holotype.—1 ♂, Goldstream, Vanc. Is., B.C., (May 31). Coll. Barnes.

Allotype.—1 ♀, Goldstream, Vanc. Is., B.C., (May 31). Coll. Barnes.

Paratypes.—7 ♂'s, 5 ♀'s (same locality and date) in Coll. Barnes, and 7 ♂'s, 5 ♀'s in Coll. E. H. Blackmore, Victoria, B.C.

In the ♂ sex the variation of the upperside is inconsiderable, consisting in the greater or less width of the dark border of primaries and the degree of distinctness of the marginal spots of secondaries which may either become more or less suffused to form a complete border or be almost completely covered by the blue scaling; occasionally a black discal lunule is present on the primaries. In the ♀ the discal lunule is at times entirely silvered, approaching in this respect *pheres;* other specimens show a more or less complete row of subterminal bluish lunules on secondaries; in none of our specimens is there anything but the very faintest traces of the red submarginal shading so often seen in typical *icarioides*. Mr. Blackmore writes us that the food plant of the larva is *Lupinus columbianus* Heller, and that the race is localized to a small hill, 700 feet high, about three miles south of Goldstream.

ADDITION TO THE ODONATA OF FRANCONIA REGION, N.H.

In the Canadian Entomologist for January, 1919, (Vol. LI, 9–15) I published a list of the Odonata of the Franconia Region. Mrs. Slosson had been good enough to send me her complete list of Odonata collected at Franconia a decade or more ago, and her annotations were included in this paper save for the addition of three species inadvertently omitted by the printer. These bring the list to seventy-five species:

73. *Ophiogomphus rupinsulensis* (Walsh).
74. *Gomphus abbreviatus* Hagen.
75. *Tetragoneuria spinigera* Selys.

Mr. L. B. Woodruff has since the publication of the list sent me also a record of *Somatochlora elongata* (Scudd.) from Bretton Woods.

R. HEBER HOWE, JR.

Thoreau Museum of Natural History, Concord, Massachusetts.

April, 1919

A NEW JAPANESE SPECIES OF THE CYRTID GENUS OPSEBIUS.

BY F. R. COLE, BUREAU OF ENTOMOLOGY, FOREST GROVE, ORE.

In a collection of Cyrtidæ kindly loaned for study by the Entomology Department of Cornell University I found one specimen which was collected at Harima, Japan. The specimen belongs to the genus *Opsebius* and is an undescribed species. As far as I know this is the first Cyrtid recorded from Japan.

The genus *Opsebius* was described in 1856 by A. Costa from a species, *O. perspicillatus*, collected in Spain. In the following year Loew described *inflatus* from Spain, and not having seen Costa's paper erected for it the genus *Pithogaster*. In 1870 Loew described *O. pepo* from Spain, and in 1871 described *O. formosus* from the locality termed Gallia, probably southern France. The five other described species in the genus are all from the United States.

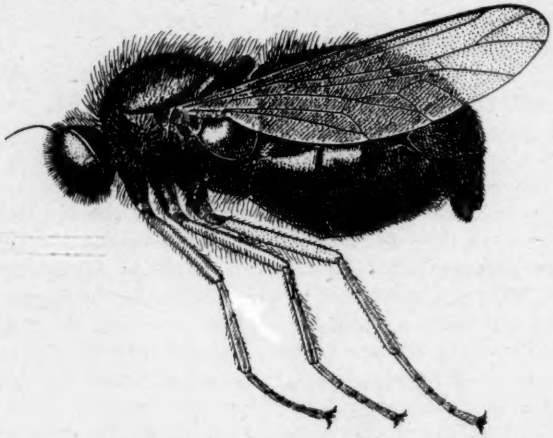


Fig. 13.—Opsebius nipponensis, n. sp.

The American species are uniformly blackish in body colour. In the three European species the body is black and yellow, and in the Japanese species described below the body colour is metallic green. All species of *Opsebius* have a characteristic cross-vein dividing the long cell above the discal. This cell may be an outer first basal or the first posterior. Loew left out this cross-vein in figuring the wing of *O. inflatus*, but Osten Sacken examined the type years afterward and found it to be present.

Opsebius nipponensis, n. sp.

♀. Eyes black with a purplish tinge. Head viewed from in front almost round. Eyes with long, dense black pile. Antennæ black with the long bristle-like arista characteristic of the genus. Occiput metallic green with long yellowish pile.

Thorax and scutellum metallic green with long, almost erect, yellowish pile. Ptero- and metapleuræ a bluish green, the upper pleuræ with yellowish pile. Squame semi-transparent and coloured a peculiar shade of brown, the rims yellowish.

Abdomen bronze green and clothed with a yellowish pile which is reclinate on the last four segments and thicker on the dorsum near the posterior margins of the segments. The abdomen is swollen in appearance and much larger than the thorax (broken at the base in this specimen). Venter much the same colour as the dorsum. Genitalia yellowish brown.

Legs honey yellow, the claws black. Wing membrane infuscated, darker toward the base. Veins blackish. Venation near the North American *O. diligens* O. S. Besides the characteristic outer cross-vein in the cell above the discal, there is a supernumerary cross-vein in one wing of this specimen just inside this vein. Length 8.5 mm.

Habitat.—One specimen collected at Harima, Japan, on May 19, 1916. The type is in the Cornell University collection.

A NEW SPECIES OF HYLEMYIA FROM CANADA (DIPTERA, ANTHOMYIIDÆ).

BY J. R. MALLOCH, F.E.S., URBANA, ILL.

The species described in this paper belongs to the genus Hylemyia, subgenus Pogonomyza S. and D. There are three other North American species of the subgenus known to the writer, all of which occur in the northeastern United States. The type specimen of the species described in this paper is in the Canadian National Collection of Insects, at Ottawa.

Hylemyia (Pogonomyza) spinosissima, sp. n.

Male.—Black, distinctly shining, entire body with rather dense, brownish gray pruinescence. Orbits, face, and cheeks with white, almost silvery, pruinescence; second antennal joint reddish yellow at apex. Thorax indistinctly vittate. Abdomen with a poorly defined dorso-central black vitta. Wing yellowish, veins pale. Calyptra and halteres yellow.

Head small; eyes separated by a little more than width of anterior ocellus; orbits sparsely bristled on almost their entire length; arista with dense, very short hairs; parafacial much narrower than third antennal joint; cheek not twice as high as width of parafacial; proboscis as thick as fore femur. Presutural acrostichals weak, 2-rowed; prealar bristle about one-third as long as the bristle behind it; sternopleurals 1:2 or 1:3; scutellum bare below. Abdomen narrow, parallel-sided, all dorsal segments with long, strong bristles on posterior margins and in a transverse series on disc; hypopygium of moderate size; fifth sternite with very short hairs. Fore tibia with from 2 to 4 bristles on antero-dorsal and on posterior surfaces; mid femur not much swollen, with a series of short bristles on entire antero-ventral surface, and 4 exclusively long, strong bristles on postero-ventral surface, the one furthest from base directed slightly apicad, situated at middle; mid tibia with 1 antero-dorsal, and 4 irregularly placed posterior bristles; hind femur with a series of bristles on antero-ventral surface, and another, weaker, series on basal half of postero-ventral surface; hind tibia with 4 or 5 strong antero-dorsal and 3 strong postero-dorsal bristles, the antero-ventral and posterior surfaces each with some setulose hairs. Costal thorn small; last sections of veins 3 and 4 subparallel.

Length 5.25 mm.

Type.—Port Hope, Ont., June 13, 1897, (W. Metcalfe).

This species is separable from its allies by the bristling of the mid femur, the postero-ventral bristles being much longer than in any of the other species, the longest at least twice as long as the femoral diameter.

A NEW SPECIES OF CŒNOSIA FROM CANADA (DIPTERA, ANTHOMYIIDÆ).

BY J. R. MALLOCH, F.E.S., URBANA, ILL.

The species described in this paper is one which was submitted for identification by the Dominion Entomologist. The type specimen is deposited in the National Collection of Insects, Department of Agriculture, Ottawa.

Cœnosia fuscifrons, sp. n.

Male.—Black, covered with dense white pruinescence. Head black, with white pruinescence except on interfrontalia; antennæ and palpi black; proboscis brown. Thorax and abdomen unmarked, apices of abdominal segments yellowish. Legs pale yellow, gradually darkened from near base of femora apicad, the tibiæ and tarsi usually fuscous, sometimes the bases of tibiæ pale. Wings white at bases, distinctly browned beyond to apices. Calyptra white. Halteres yellow.

Frons nearly twice as long as broad; orbits narrow, well defined, the bristles long, upper pair shorter than second and ocellars; antennæ reaching over two-thirds of the distance to mouth-margin, third joint slightly angulate at apex above; arista bare; parafacial in profile almost linear; cheek higher than width of third antennal joint, the margin with a few long, slender bristles. Humeral angle with one long and four or five short, stout bristles; presutural acrostichals in an irregular single or double series; intra-alar bristles weak; lower stigmatal bristle weak or absent, when present directed laterad or slightly upward. Abdomen short, cylindrical, dorsum with a few scattered setulose hairs; hypopygium small, retracted; fifth sternite with a large V-shaped excision, the processes short and broad. Legs long and slender, the bristles hair-like; basal joint of tarsi on all legs at least half as long as tibiæ; fore tibia with one median posterior bristle; mid tibia with the two median bristles very short, situated at about the same distance from base; hind tibia with the antero-ventral bristle very weak and short, the antero-dorsal and preapical dorsal bristles each over one-third as long as tibia. Inner cross-vein of wing below apex of first vein; third vein ending in apex of wing; apex of fourth basad of apex of third.

Length 2.25 mm.

Type.—Brockville, Ont., August 12, 1903, (W. Metcalfe). Paratypes, Ottawa, August 17, 1907, (J. Fletcher); Port Hope, Ont., May 14, 1897, (W. Metcalfe).

This species most closely resembles *argentate* Coquillett of the North American fauna, but may readily be separated from that species by the narrower frons and the colour of same, which is fuscous instead of silvery.

Mailed April 28th, 1919.